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Short report

Effectiveness of automated appointment reminders in psychosis community services: a randomised controlled trial

Eugenia Kravariti*, Christopher Reeve-Mates*, Rafaela Da Gama Pires*, Elias Tsakanikos*, Daniel Hayes, Siobhan Renshaw, Sarah McAllister, Vishal Bhavsar, Pam Patterson, Emily Daley, Jane Stewart, Megan Pritchard, Hitesh Shetty, Rosalind Ramsay, Rocio Perez-Iglesias* and Philip McGuire*

Summary

We report on the first open-label, parallel group randomised controlled trial of automated appointment reminders in a psychosis community service in the UK. Ninety-five patients were randomly allocated to receiving/not receiving automated messaging reminders 7 days and 1 day before appointments. All 'Attended' and 'Missed' appointment outcomes over 6 months were analysed using cluster regression analysis. Reminded appointments were significantly more frequently attended than non-reminded appointments (unadjusted odds ratio (OR) = 3.54, 95% CI 1.36–9.22, $P = 0.01$; adjusted OR = 2.95, 95% CI 1.05–8.85, $P < 0.05$). Automated messaging reminders can provide a robust strategy for promoting engagement with psychosis services.

Declaration of interest

The authors have no competing financial interests to declare in relation to the current work. Sarah McAllister

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Approximately 1 in 10 out-patient hospital appointments are missed in the UK every year, costing the National Health System (NHS) an astounding £745 million in 2012/13.¹ 'No shows' are up to three times higher in mental health services,^{2,3} increasing risk for functional decline, symptom exacerbation and suicide.^{4,5}

Across health services, automated appointment reminders reduce non-attendance by 29%,⁶ but have been infrequently investigated in severe mental illness.^{3,7–10} High-quality studies that can inform the effectiveness, practicality and acceptability of this approach in the context of psychosis are scarce.^{7,8,10,11} We report on the first randomised controlled trial (RCT) of automated short message service (SMS) appointment reminders in a psychosis community service (PCS) in the UK. We hypothesised that patients randomly allocated to the SMS intervention would miss significantly fewer appointments compared with controls.

Methods

The study was an open-label RCT with a parallel group design (NHS Research Ethics Committee reference 13/LO/0497; ClinicalTrials.gov registration number NCT01793220; full record accessible at <https://clinicaltrials.gov/>). Recruitment was conducted and the primary outcome ('appointment attendance') assessed in February–July 2014 in the Psychosis Recovery and Support Community Service in Lambeth South, London. The PCS underwent radical restructuring in summer 2014. This led to relocation of patients and their clinical teams to other PCSs, and to an unplanned study termination before secondary outcomes could be assessed. By July 2014, 95 participants had entered the study according to the following inclusion criteria: mobile phone ownership, decisional capacity (assessed by a capacity-to-consent scale),¹²

willingness to receive SMS reminders and written informed consent to participate. Participants were randomly allocated to receiving/not receiving automated text message appointment reminders on their personal mobile phones 7 days and 1 day before each appointment. The intervention was an adjunct to routine reminder practices (e.g. letters) in the service.

Random allocation was balanced (ratio 1:1), leading to approximately equal group sizes (46 participants in the intervention arm, 49 participants in the control arm). D.H. generated the random allocation sequence prior to the study, using an online tool (<https://www.random.org/sequences/>) which randomly divided integers into 'intervention' and 'control' columns. Allocation outcome was determined by whether each participant's serial recruitment number matched an integer in the 'intervention' or the 'control' column. Participants were recruited, enrolled and assigned to groups by C.R.-M., R.D.G.P., S.R. and S.M., who were informed of each consecutive allocation outcome by E.K.. The same authors enabled the automated reminders using the inbuilt functionality of ePJS (electronic patient journey system), the electronic clinical records system used in the PCS (where this functionality had never been enabled prior to the study). The reminder text read 'You have an appointment with Lambeth South at [TIME] on [DATE]. Please call XXXXXXXXXXXX if you cannot come'. Participant appointments and attendance outcomes were separately entered into ePJS by the research and clinical teams, respectively, as soon as they were scheduled and known.

Data extraction and analysis were conducted from September 2014 to March 2015, using the Clinical Records Interactive Search (CRIS) system¹³ and Stata 11.0, respectively. CRIS provides authorised researchers with regulated access to over 250 000 fully anonymised ePJS records. Ethical approval for CRIS as an anonymisation portal for secondary analyses was provided by an NHS research ethics committee in accordance with the Declaration of Helsinki, as well as by the Institute of Psychiatry's Institutional Review Board. To enable data extraction, the research team

* These authors contributed equally to this manuscript (joint first or joint last authors).

tagged all participant appointments in ePJS at the point of appointment entry using unmodifiable study- and arm-specific tags. These were later used as search terms in CRIS to extract the data.

The unit of analysis was 'appointment'. Power analyses using an alpha of 0.05, power of 0.80 and various simulated effects ranging from small to large determined a desired size of 88–1511 appointments per study group (supplementary Table 1, available at <https://doi.org/10.1192/bjo.2017.7>).

Observations relating to appointments scheduled for the same individual (4.73 appointments on average) were dependent. Therefore, 'Attended' and 'Missed' outcomes were compared between the study arms using logistic regression analysis for clustered observations, before and after adjusting for variables that differed significantly between groups (see Results) or that significantly predicted attendance in preliminary logistic regression analyses (only 'Diagnosis'; see supplementary Table 2). We next repeated the analysis in the schizophrenia subgroup.

A CONSORT 2010 information checklist and flow diagram of the study stages are presented in supplementary Table 3 and Fig. 1, respectively.

Results

Of the 95 participants, six intervention and 14 control participants ($\chi^2 = 3.44$; $P = 0.06$) had no appointments (and therefore no identifying tags) entered in ePJS during the study period. In the context of a fully anonymised analysis, it was not possible to extract and analyse the respective clinical/demographic data. The remaining 75 participants (40 intervention, 35 control) contributed a total of 355 appointments (intervention, 197; control, 158); 113 7-day reminders and 168 1-day reminders were sent without error to mobile phones owned by participants in the intervention arm. These figures suggest that of the 197 intervention appointments, 113 received both reminders, 55 received only 1-day reminders (because the appointment was scheduled for a date less than 7 days later) and 29 received no reminders.

The characteristics of the analytic cohort ($n = 75$) are presented in Table 1. The intervention and control groups differed

significantly only in diagnosis (Table 1). As there were no significant differences in 'Cancelled', 'Not Known/Recorded' and 'Other' appointment outcomes among the study groups (Table 1), the analysis focused on appointments with the main outcomes of interest, i.e. 'Attended' v. 'Missed' ($n = 275$) (Table 1). Of the 151 reminded appointments with such outcomes, 138 (91%) were 'Attended' and 13 (9%) 'Missed', compared with 93 (75%) and 31 (25%), respectively, of the 124 non-reminded appointments (unadjusted odds ratio (OR) = 3.54, 95% CI 1.36–9.22, $P = 0.01$).

After adjusting for diagnosis, the OR remained robust and statistically significant (adjusted OR = 2.95, 95% CI 1.05–8.85, $P < 0.05$). In the schizophrenia sub-analysis, the OR remained robust, but the statistical significance became a trend (OR = 3.78, 95% CI 0.82–17.42, $P = 0.09$), possibly reflecting the decrease in statistical power (148 appointments: 92 intervention, 56 control).

Discussion

Against a background of routine SMS implementations in the NHS, the systematic examination of their use in patients with psychosis is a novelty of the present study. This population presents unique challenges, including reduced insight, cognitive deficits, psychopathology, confidentiality concerns, and unemployment affecting rates of mobile phone ownership.^{14,15} Notwithstanding these barriers, the balance of attended versus missed appointments in our study was markedly improved among participants who received automated messaging reminders (91% v. 9%) compared with those who did not (75% v. 25%).

Our RCT was fully integrated into the routine practice of a PCS; addressed a pervasive problem with profound financial and health costs; and had high ecological validity, excellent confidentiality and anonymity, no known harmful effects, and important cost and clinical implications. Owing to the redistribution of patients across PCSs in summer 2014, the study was terminated before patient perceptions and other secondary study outcomes could be assessed. A notable methodological weakness is that the study would have lacked power to detect hypothetical smaller effects. Although our participants' random allocation to the study arms

Table 1 Participant characteristics and appointment outcomes

	Study group		Group comparison	
	Intervention	Control	Statistic	P-value
Number of participants	40	35		
Age (Mean \pm SD)	42.50 \pm 8.96	41.77 \pm 9.30	$t = 0.35$	0.73
Gender (Male)	20 (50%)	22 (63%)	$\chi^2 = 1.25$	0.26
Ethnicity			$\chi^2 = 0.51$	0.77
White	18 (45%)	13 (37%)		
Black	16 (40%)	16 (46%)		
Asian or mixed	6 (15%)	6 (17%)		
Diagnosis/ICD10 ¹⁷ code			$\chi^2 = 8.51$	0.04*
Schizophrenia/F20	23 (58%)	17 (49%)		
Schizoaffective disorder/F25	6 (15%)	1 (3%)		
Bipolar affective disorder/F31	7 (18%)	5 (14%)		
Other ^a	4 (10%)	12 (34%)		
Appointment outcomes				
Cancelled	29 (15%)	20 (13%)		
Not known/recorded	13 (7%)	12 (8%)	$\chi^2 = 0.57$	0.75
Other ^b	4 (2%)	2 (1%)		
Attended	138 (70%)	93 (59%)	OR = 3.54	0.01*
Missed	13 (6%)	31 (20%)	OR = 2.95 ^c	0.04*

OR, odds ratio.
^a Including 'Mental and Behavioural Disorder due to Use of Alcohol: Psychotic Disorder/F10.5', 'Delusional Disorder/F22', 'Acute and Transient Psychotic Disorder/F23', 'Unspecified Nonorganic Psychosis/F29' and 'Severe Depressive Episode with Psychotic Symptoms/F32.3'.
^b Including 'Inpatient Event/Shift', 'DNA by Trust' and 'Arrived Late but Could Not Be Seen'.
^c Adjusting for 'Diagnosis'.
 * $P < 0.05$.

was balanced (1.07 : 1.00), the number of appointments was slightly unequal (1.25 : 1.00), pointing to a potential study limitation. Indeed, equal allocation is the most efficient approach in RCTs.¹⁶ Although the reminder text invited participants to notify staff of their inability to attend, the study arms showed comparable cancellation rates. As the numbers of non-reminded ($n = 29$) and 'Cancelled' ($n = 29$) appointments in the intervention arm were exactly the same, a likely explanation is that most, if not all, cancelled appointments were cancelled *before* any reminders were sent, thus minimising any reminder effects on cancellation rates. As the anonymous reminder data were provided directly by the South London and Maudsley (SLaM) clinical systems team rather than retrieved from CRIS, we cannot verify this highly plausible explanation. Finally, although we cannot exclude the possibility that some participants perceived the reminders as patronising and intrusive, it is encouraging that no individual complained or asked to withdraw from the study. Further, it is worth noting that a more welcoming messaging reminder might have been even more effective than our neutrally worded prompt.

Our findings add to emerging evidence^{3,7–11} that automated messaging reminders provide a feasible and robust strategy for engaging people with psychosis in healthcare. Although still a comparatively untapped resource for psychosis, SMS applications show exciting potential for promoting positive patient outcomes and transforming healthcare.

Eugenia Kravariti, PhD, **Christopher Reeve-Mates**, MSc, **Rafaela Da Gama Pires**, PGDip, King's College London, Department of Psychosis Studies, Institute of Psychiatry, Psychology & Neuroscience, London, UK; **Elias Tsakanikos**, PhD, University of Roehampton, Department of Psychology, London, UK; **Daniel Hayes**, MSc, King's College London, Department of Psychosis Studies, Institute of Psychiatry, Psychology & Neuroscience, London, UK, and Evidence Based Practice Unit, UCL and Anna Freud National Centre for Children and Families, London, UK; **Siobhan Renshaw**, BSc, Brunel University London, Department of Psychology, Middlesex, UK; **Sarah McAllister**, RMN, MRes, BSc Hons, **Vishal Bhavsar**, MD, King's College London, Department of Psychosis Studies, Institute of Psychiatry, Psychology & Neuroscience, London, UK, and South London and Maudsley NHS Foundation Trust, Bethlem Royal Hospital, Kent, UK; **Pam Patterson**, RGN, RMN, **Emily Daley**, MRCPsych, **Jane Stewart**, South London and Maudsley NHS Foundation Trust, Bethlem Royal Hospital, Kent, UK; **Megan Pritchard**, MSc, King's College London, Department of Psychological Medicine, Institute of Psychiatry, Psychology & Neuroscience, London, UK, and The National Institute for Health Research (NIHR) Biomedical Research Centre (BRC) at South London and Maudsley NHS Foundation Trust and the Institute of Psychiatry, Psychology & Neuroscience at King's College London, King's Health Partners Academic Health Sciences Centre, London, UK; **Hitesh Shetty**, MSc, The National Institute for Health Research (NIHR) Biomedical Research Centre (BRC) at South London and Maudsley NHS Foundation Trust and the Institute of Psychiatry, Psychology & Neuroscience at King's College London, King's Health Partners Academic Health Sciences Centre, London, UK; **Rosalind Ramsay**, MBBS, South London and Maudsley NHS Foundation Trust, Bethlem Royal Hospital, Kent, UK; **Rocio Perez-Iglesias**, PhD, **Philip McGuire**, PhD, King's College London, Department of Psychosis Studies, Institute of Psychiatry, Psychology & Neuroscience, London, UK, and South London and Maudsley NHS Foundation Trust, Bethlem Royal Hospital, Kent, UK

Correspondence: Eugenia Kravariti, Institute of Psychiatry, Psychology and Neuroscience, King's College London, PO Box 63, De Crespigny Park, SE5 8AF, UK. Email: eugenia.kravariti@kcl.ac.uk

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Supplementary material

Supplementary material is available online at <https://doi.org/10.1192/bjo.2017.7>.

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